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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte STEPHAN HÜFFER, FRANK-PETER LANG, ALEJANDRA GARCIA MARCOS, ALEXANDER WISSEMEIER, and WOLFGANG STAFFEL

Appeal 2016-004992
Application 13/533,083[1]
Technology Center 1600

Before JEFFREY N. FREDMAN, RACHEL H. TOWNSEND, and DEVON ZASTROW NEWMAN, *Administrative Patent Judges*.

NEWMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

This appeal under 35 U.S.C. § 134 involves claims to a process for fertilizing plants. The Examiner entered final rejections for obviousness.

We have jurisdiction under 35 U.S.C. § 6(b). We AFFIRM.

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[1] Appellants identify the Real Party in Interest as BASF SE, Ludwigshafen, Germany. Br. 2.

STATEMENT OF THE CASE

Background

The Specification provides that fertilizers are used "to improve the essential mineral content" of soils. Spec. 1:29–31.

> However, it is observed that, in many cases, only fractions of the minerals supplied to the soil are indeed taken up into plants. A considerable fraction of the minerals supplied, in contrast, is not taken up but enters the groundwater, where in particular nitrates and phosphates are undesired. Excess fertilizer application, therefore, is not acceptable.

Id. at 1:31–34.

The Specification discloses "the use of aqueous formulations comprising (A) one or more aminocarboxylates, selected from among methylglycine diacetate (MGDA) and its alkali metal salts and glutamic diacetate (GLDA) and its alkali metal salts, to be applied to plants or the ground or growth substrates." *Id.* at 1:23–27.

The Claims

Claims 7, 9, 21, 22, 24, and 27 are on appeal. Sole independent claim 7 is illustrative and reads as follows:

> Claim 7: A process for fertilization plants, the process comprising manually or mechanically applying a formulation to a ground or a plant,
>
> wherein the formulation comprises:
>
> at least one aminocarboxylate selected from the group consisting of a methylglycine diacetate, a methylglycine diacetate alkali metal salt, a glutamic diacetate, and a glutamic diacetate alkali metal salt
>
> at least one inorganic compound selected from the group consisting of an inorganic phosphate, an inorganic phosphite,

an inorganic nitrate, an ammonium salt, and a potassium salt; and

optionally water.

Br. 10 (Claims Appendix 1).

The Issue

The Examiner rejected claims 7, 9, 21, 22, 24, and 27 under 35 U.S.C. § 103(a) as obvious over Bersworth[2] in view of Tamura.[3] Ans. 2.

The Examiner finds that Bersworth discloses a process for "fertilizing plants comprising applying a formulation to a plant, wherein the formulation comprises *i)* an ammonium phosphate fertilizer, and *ii)* 25 wt% of a chelating agent alkali metal salt (i.e. such as NaEDTA) capable of chelating heavy metal ions; and the formulation can be in the form of granules." *Id.* The Examiner finds that Bersworth does not "explicitly disclose that the chelating agent capable of chelating heavy metal ions is methylglycine diacetate alkali metal salt, or that the applied formulation contains water and can be applied 'mechanically.'" *Id.* at 3.

The Examiner finds that Tamura discloses "a process for facilitating heavy metal uptake by plants comprising spraying (i.e. mechanically applying) a formulation comprising methylglycine diacetate alkali metal salt (i.e. a chelating agent capable of chelating heavy metal ions); wherein the

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[2] Frederick C. Bersworth and Albert E. Frost, US 3,076,701, issued Feb. 5, 1963 ("Bersworth")
[3] Tamura et al., US 2008/0071130 A1, published Mar. 20, 2008 ("Tamura")

formulation can be in the form of powder, granules, or aqueous solution (i.e. contains water)." *Id.*

The Examiner concludes that it would be obvious to "combine the respective teachings of Bersworth *et al.* and Tamura *et al.,* [], to devise Appellants' claimed method of fertilizing plants" because the skilled artisan

> would readily know that diammonium hydrogen phosphate is a common ammonium phosphate fertilizer; and since Tamura *et al.* disclose that methylglycine diacetate alkali metal salt is preferable to EDTA as a chelating agent, as the biodegradable methylglycine diacetate alkali metal salt exhibits roughly the same chelating ability as EDTA without the drawbacks of remaining in the soil and causing secondary environmental contamination . . . and that the methylglycine diacetate alkali metal salt can be sprayed (i.e. "mechanically applied") in aqueous solution (i.e. further contains water) . . . one of ordinary skill in the art would be motivated to employ methylglycine diacetate alkali metal salt as the chelating agent in the formulation of Bersworth *et al.,* and to spray the formulation on plants in aqueous solution form, with the reasonable expectation that the resulting method will conveniently and evenly apply the formulation to render heavy metal nutrients in soil available to plants without causing secondary environmental contamination.

Id. at 3–4.

The issue with respect to this rejection is: Does the evidence of record support the Examiner's conclusion that claim 7 is obvious over the cited prior art?

Findings of Fact

FF1. Bersworth discloses "ammonium phosphate fertilizers containing chelating agents and/or metal chelates. . . . for solubilizing and rendering trace elements present in the soil available to plants." The composition "of

ammonium phosphates contain[s] chelating agents and/or metal chelates, such that iron and other essential trace elements are made available to plants in the form of their chelates." Bersworth 1:57–69.

FF2. Bersworth discloses that

> to eliminate formation of insolub[l]e salts during ammoniation of production acids and mixtures of acids[,] a chelating agent capable of forming a soluble, stable chelate with the heavy metal ions present, iron and aluminum in particular, is added thereto in [an] amount sufficient to chelate all the metal present. The effect is not only to keep the metals in solution during the ammoniation but also to render them available to plants as part of the fertilizer produced.

Id. at 1:70–2:6.

FF3. Bersworth discloses that alkali metal, for example "ethylenediaminetetraacetic acid and its alkali metal salts added may be [added] in stoichiometric ratio to the heavy metal contaminants present, but preferably is in excess." *Id.* at 2:27–34.

FF4. Bersworth discloses:

> The utilization of an excess of chelating agent or precursors of chelating agents, the nitriles, over and above that required to react with the heavy metal contaminants present serves to improve the ammonium phosphate fertilizer produced, because the excess chelating agent serves to solubilize and render available to plants trace mineral nutrients normally present in the soil in insoluble form and, hence, unavailable to the plant.
>
> The preformed metal chelates of the trace metal elements may also be added to the production phosphoric acid alone or in conjunction with a stoichiometric or excess quantity of chelating agent. Typical preformed chelates which may be added are those of manganese, magnesium, zinc, iron, molybdenum, etc. Ammonium phosphate fertilizers containing the preformed trace metal chelates when applied to the soil effect a more rapid

> elimination of trace element deficiencies than do such compositions which contain chelating agents and little or no metal chelates.

Id. at 2:54–72.

FF5. Bersworth discloses preparation of an ammonium phosphate fertilizer containing EDTA in granular form. *Id.* at 3:20–34. "Application of the finished fertilizer to chlorotic corn plants completely eliminated the iron deficiency within 4 weeks." *Id.* at 3:42–44.

FF6. Bersworth discloses:

> The ammonium fertilizer (phosphate, nitrate, sulfate or mixture) may also be prepared by forming the composition and spraying preformed metal chelates onto the material before granulating or pelleting it. A typical product of this kind would contain, for example, equal parts of ammonium sulfate, ammonium dihydrogen phosphate, a small amount of a potassium salt and about 0.01 to 1 percent by weight of each of the preformed chelates of iron, zinc and copper. The exact metals to be used may vary as agricultural conditions require.

Id. at 4:9–18.

FF6. Claim 5 of Bersworth recites "An ammonium phosphate fertilizer in accordance with claim 4, which contains from about 0.01 percent to 25 percent of the said chelating agent." *Id.* at 8:27–29.

FF7. Tamura discloses:

> A method of cleaning a contaminated soil which performs cleaning of a soil containing heavy metals in a shorter term than before and, at the same time, utilizes phytoremediation having little influence on the environment. The object is attained by absorbing heavy metals by a plant . . . and, at the same time, adding a biodegradable chelating agent to a contaminated soil in order to assist the absorption. And, a biodegradable chelating agent having the high heavy metal dissolving out ability not only

> enhances the cleaning efficacy but also reduces secondary influence on the environment.

Tamura Abstract.

FF8. Tamura discloses that the prior art teaches a method of "effectively cleaning up a soil by selecting a plant excellent in the ability to absorb heavy metals, planting it into a contaminated soil is introduced, and, in the known publication 3, a method of adding a chelating agent to a soil to promote dissolution of heavy metals is introduced." *Id.* at ¶ 8.

FF9. Tamura discloses

> a soil cleaning method of performing cleaning by absorbing a contaminating substance contained into a contaminated soil by a plant (phytoremediation), said method of cleaning heavy metals containing soil comprising adding a biodegradable chelating agent promoting absorption of heavy metals by the *Fagopyrum* plant to the contaminated soil, wherein the contaminating substance is heavy metals.

Id. ¶ 15.

FF10. Tamura discloses a "biodegradable chelating agent [that is] one or two or more kinds selected from methylglycine diacetate (MGDA), ethylenediamine succinic acid (EDDS), L-glutamic acid diacetate (GLDA) and L-aspartic acid diacetate (ASDA) as well as a salt thereof are used" and that it is "desirable to use methylglycine diacetate and/or a salt thereof as the biodegradable chelating agent." *Id.* at ¶¶ 16–17.

FF11. Tamura discloses an "extremely low" fear of secondary contamination because "the biodegradable chelating agent is degraded

with microorganisms or enzymes in a soil, and hardly remains in the earth." *Id.* at ¶ 51.

FF12. Tamura discloses that because "ethylenediamine tetraacetic acid (EDTA) which has been previously known to have the high lead dissolving out ability is [not]degradable, it remains in a soil, and may cause secondary environmental contaminant[s] EDTA is not preferable." Tamura discloses that "biodegradable chelating agents exhibit[ing] approximately the same lead dissolving out ability as that of the EDTA [are] methylglycine diacetate (MGDA), ethylenediamine succinic acid (EDDS), and L-glutamic acid diacetate (GLDA)." *Id.* at ¶¶ 54, 55.

FF13. Tamura discloses "[t]he biodegradable chelating agent can be added to a soil by a method of spraying or sprinkling granules, powders or an aqueous solution directly to a soil." *Id.* at ¶ 58.

FF14. Tamura discloses that chelating agents include "methylglycine diacetate (MGDA), ethylenediamine succinic acid (EDTS)," "disodium ethylenediamine tetraacetate (EDTA2Na) [and] trisodium methylglycine diacetate (MGDA3Na)." *Id.* at ¶¶ 52, 68.

Principles of Law

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.,* 550 U.S. 398, 416 (2007). "If a person of ordinary skill can implement a predictable variation, § 103 likely bars its patentability." *Id.* at 417.

Wrigley found a "strong case of obviousness based on the prior art references of record. [The claim] recites a combination of elements that were all known in the prior art, and all that was required to obtain that combination was to substitute one well-known ... agent for another." *Wm. Wrigley Jr. Co. v. Cadbury Adams USA LLC,* 683 F.3d 1356, 1364 (Fed. Cir. 2012).

Analysis

We adopt the Examiner's findings regarding the scope and content of the prior art (Final Act.[4] 2–8; FF 1–14) and agree that the claimed process for fertilizing plants would have been obvious over the teachings of Bersworth and Tamura. We address Appellants' arguments below.

Appellants argue that the claimed alkali metal salt "is only mentioned tangentially in lines 28 and 33 of column 2" of Bersworth. *Id.* at 5. This argument is not persuasive as "[i]t is well settled that a prior art reference is relevant for all that it teaches to those of ordinary skill in the art." *In re Fritch*, 972 F.2d 1260, 1264 (Fed. Cir. 1992). Bersworth discloses the claimed heavy metal as one of a limited number of options disclosed for use in the invention. FF3. Therefore, one of skill in the art would understand the claimed heavy metal was suitable for use in forming a "soluble, stable chelate with [] heavy metal ions." FF2.

Appellants argue that because Tamura describes

> how to remove heavy metal compounds from plants . . . A person skilled in the art would not have considered Tamura when confronted with the task of fertilization [and that even if Tamura

[4] Examiner's Final Action, mailed November 5, 2014.

> were considered] the person of skill would not have combined the two references because of the disincentive from Tamura of potentially poisonous heavy metal compounds such as uranium compounds - would be provided into the ground.

Br. 5.

This argument is not persuasive as Tamura does not disclose "how to remove heavy metal compounds from plants." Rather Tamura discloses a method of cleaning contaminated soil using plants that absorb heavy metals (phytoremediation). FF7. The phytoremediation process is assisted by inclusion of a chelating agent such as MGDA or EDDS. FF10. Thus, Tamura teaches that plants can absorb heavy metal compounds from soil, particularly when assisted by the disclosed chelating agents. FF7–12.

In that context, the question of whether Tamura is analogous art is determined by whether the reference is "either . . . in the field of the applicant's endeavor or, if not, then . . . [is] reasonably pertinent to the particular problem with which the inventor was concerned." *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992). Here, the inventors were concerned with how to fertilize plants and, in particular, how to maximize uptake of trace minerals by plants. We agree with the Examiner that Tamura is analogous art because Tamura, like Bersworth is "concerned with promoting heavy metal dissolution in soil and heavy metal absorption from soil into plant[s]" and "achieve this end by applying a chelating agent to the soil" to facilitate absorption by the plants. Ans. 5. Indeed, Tamura addresses *maximizing* heavy metal uptake for the purposes of phytoremediation. FF8.

Appellants next argue that "EDTA raises significant environmental concerns when subjected to the ground" and, therefore, the skilled artisan "would refrain from applying any such complexing agents to the ground or

plants due to such concerns." Br. at 5–6. As a result, Appellants argue, "the teachings of removing heavy metals from the soil has no nexus to providing something beneficial to the plant." *Id.* at 6.

This argument is not persuasive because Tamura acknowledges the environmental concern with EDTA and consequently teaches that using EDTA is not preferable. FF12. Instead, Tamura teaches, it is "desirable to use methylglycine diacetate and/or a salt thereof as the biodegradable chelating agent" which has "approximately the same lead dissolving out ability as that of the EDTA" and that in doing so, there is an "extremely low" fear of secondary contamination because "the biodegradable chelating agent is degraded with microorganisms or enzymes in a soil, and hardly remains in the earth." FF10–12.

Appellants further argue that unexpected results as discussed in the Hüffer Declaration[5] are sufficient to rebut the Examiner's prima facie case of obviousness. Br. 6. Appellants argue:

> Dr. Hüffer analyzed stability constants for MGDA and EDTA and concluded that EDTA should have provided better results in mobilizing cations from the soil compared to MGDA and thus should have provided better results. Moreover, even though MGDA has a weaker stability of the respective complexes than E[D]TA, MGDA was shown to be more efficient in transferring potassium and phosphate to the plants.

Id. The Appellants argue this data shows "a significant and unexpected effect whereby the greater uptake shown in the data would naturally result in a fertilizing effect to the physical plant(s)." *Id.* at 6–7. According to

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[5] Declaration under 37 C.F.R. 1.1.32 of Stephan Hüffer, dated January 2014.

Appellants, this improved efficiency "would not have been reasonably predictable from the teachings of Bersworth and Tamura and moreover in light of the stability constants discussed in the [Hüffer] Declaration." *Id.* at 8.

Mr. Hüffer provides the following Tables in support of his Declaration:

Table 1 (with addition)

	K_2O [wt-%]	P_2O_5 [wt-%]	dosage complexing agent in fertilizer solution [mmol]
F.1	1.73	0.53	50.5
F.2	1.26	0.50	52.5
EF.3	1.56	0.71	40.5
EF.4	1.64	0.61	42.5
V-F.5	1.53	0.55	-
V-F.6	1.30	0.34	-
V-F.7	1.51	0.51	39.6

Table 1 lists the result of analysis after treating tomato plants with 13.3 ml of fertilizer solution for 35 days.

Table 2 (with addition)

	K_2O [wt-%]	P_2O_5 [wt-%]	dosage complexing agent in fertilizer solution [mmol]
F.1	1.69	0.48	50.5
F.2	1.26	0.51	52.5
EF.3	1.56	0.66	40.5
EF.4	1.64	0.61	42.5
V-F.5	1.53	0.51	-
V-F.6	1.21	0.29	-
V-F.7	1.52	0.50	39.6

Table 2 lists the result of analysis after treating tomato plants with 13.3 ml of fertilizer solution for 70 days.

Although there is some discrepancy between the identification of samples in Mr. Hüffer's Declaration[6] and the Specification, we ascertain the

[6] Mr. Hüffer declares the experiments were conducted "in accordance with chapter II.1 of our application" but using 13.3 ml of fertilizer solution

following about these data. Samples F.1, F.2, EF.3, EF.4, and V-F.5 contain varying amounts of the tripotassium salt of methylglycinediacetate (A.1) as well as other compounds, or water alone. V-F.6 contained water alone and V-F.7 contained an amount of EDTA different from any of compounds F.1, F.2, EF.3, EF.4, and V-F.5, and water. *See generally* Spec. p. 13–14 and Hüffer Declaration p. 2.

> Mr. Hüffer declares that
>
> [j]udging from the stability constants (log K) for complex formation of MGDA and EDTA, EDTA should have provided better results in mobilizing cations from soil compared to MGDA, and EDTA should have provided better results in preventing immobilization of cations, and less potassium and/or less phosphate were to be expected in the plants. . . . Although MGDA has a weaker stability of the respective complexes than EDTA it is more efficient in transferring potassium and phosphate to the tomato plants. This was not to be expected when comparing the stability constants.

Id. at 2–3.

We are not persuaded that the Hüffer Declaration provides evidence of unexpected results. First, the content of chelating agent EDTA in comparative formulation V-F.7 does not contain an "inorganic compound selected from the group consisting of an inorganic phosphate, an inorganic phosphite, an inorganic nitrate, an ammonium salt, and a potassium salt" as required by claim 7; accordingly, the comparison is not commensurate in

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derived from comparative formulation V-F.7 instead of 10 ml. Accordingly, we assume the reference to "comparative formulation V-F.5" at the top of page 2 should read "comparative formulation V-F.5" as indicated by subheading I.7. *See generally* Spec. p. 13–14.

scope with the claimed invention. Moreover, the amount of chelating agent EDTA in comparative formulation V-F.7 is not identical to the amount of MDGA in any sample, precluding a direct comparison of the effects of MDGA and EDTA. Thus, it is not possible to determine whether the claimed increased effect of MDGA in comparison to EDTA is a "'difference in kind' that is required to show unexpected results," rather than merely a difference in degree, which is not sufficient to support an argument of unexpected results. *In re Harris*, 409 F.3d 1339, 1344 (Fed. Cir. 2005) (stating that a "32–43% increase in stress-rupture life, however, does not represent a 'difference in kind' that is required to show unexpected results" where the prior art teaches that limiting certain ingredients will have a positive effect on factors related to an improved stress-rupture life). Tamura teaches that where amounts of EDTA or MGDA are increased, both show increased chelating ability. (Tamura Fig 3.) Accordingly, we do not find persuasive Appellants' argument that the results of Tables 1 and 2 are unexpected in light of our findings of fact (FF 1–14) regarding the teachings of the prior art, including that MDGA is a "desirable" chelating agent.

Appellants further argue the Examiner impermissibly applies hindsight in refusing to consider "any property, benefit, or characteristic of the invention Applicant wishes to discuss in rebuttal" and in "requiring comparison of the results of the invention with the results of the invention." Br. 8. According to Appellants,

> the knowledge available to one of ordinary skill (as established in the submitted Declaration) clearly teaches that with respect to the different stability constants, one would have been motivated to use EDTA for the purposes of Bersworth and lead one away

> from the use of MGDA, contrary to the Examiner's position and contrary to the invention claimed.

Id. at 8–9.

We are not persuaded. As the Examiner found, the teachings of Bersworth and Tamura suggest a process for fertilizing plants using the claimed formulation, thereby rendering the appealed claims obvious. *See* FF1–14. Appellants' evidence of secondary considerations in the form of Dr. Hüffer's Declaration of unexpected results, is unpersuasive as addressed above. Absent other evidence of secondary considerations, which Appellants have not provided, we are unpersuaded that the Examiner has unduly rejected evidence or arguments submitted by Appellants.

Conclusion of Law

A preponderance of the evidence of record supports the Examiner's conclusion that claim 7 is obvious over the cited prior art. Claims 9, 21, 22, 24, and 27 have not been argued separately and therefore fall with claim 7. 37 C.F.R. § 41.37(c)(1)(iv).

SUMMARY

We affirm the rejection of all claims.

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a).

AFFIRMED